In order to determine the total time of the performance time, we can divide the time into several portion, *T1* for the time that drones flying from the ground to the sky; *T2* for the rotation time in the sky; *T3* for the different graphs changing time; and *T4* for the landing time. Assume that there are *x* batches of drones flying from the ground to the sky, and the flight distance of the *i*th drone is *Li*, and *Lij* shows the partial distance during the T*j* period such as *Li1* is the departure time, the *Li2* is the changing time, and (*xi1*, *yi1)* and (*xi2*, *yi2*) illustrates the drone’s initial position on the ground and the position in the sky. More specifically, the departure time can be subdivided into the time that drones fly vertically to the sky and the shaped time. Define as each flight distance during the first process. The equation can be deduced following,

where is the constant velocity of the drone flying vertically to the sky. Therefore, can be derived:

About the rotation time, we just need to consider the rotation time of the outermost points because require the longest time for rotation. Assume that the center of the rotation is the origin, then the equation:

where , which is the largest velocity, is the outermost points’ velocity, determined by the drones’ Product parameters and manipulators. And the angular velocity of whole system can be determined by:

Moreover, the changing time actually has been expressed in the

For the landing time, it is equal to the take-off period,

By parameterizing every time period and assuming that the number of the performing pattern is *n*,the total time of whole aerial light shows can be expressed as following：